ARTICLE 34 AMENDMENTS

introduction of low density voids or bubbles into the cementitious mixture, and the resultant products are usually referred to as "cellular" concretes. These typically have densities in the range of 500 to 1000 kg/m^3 but their compressive strengths are seldom in excess of 5 MPa. Consequently, they are often unsuitable for load bearing applications. Indeed, one of the main applications for such products is for thermal insulation. It would be desirable to provide cementitious products with similar densities but with enhanced compressive strength. Furthermore, in order to promote enhanced hardening, some cellular concretes are typically prepared using high pressure autoclaves. The equipment costs involved are very high, and it would be desirable to provide an alternative means for preparing suitably low density cementitious products using relatively simple and less expensive techniques.

The present invention seeks to provide a method of manufacturing a cementitious product which satisfies the aforementioned needs and overcomes the disadvantages associated with the prior art techniques described.

Accordingly, the present invention provides a method of manufacturing a porous cementitious product, which method comprises:

forming a cementitious premix;

casting the premix in a desired configuration;

generating gas bubbles within the premix; and

curing the premix,

wherein the gas bubbles are generated and/or collapsed at specific locations within the premix in order to produce a porosity profile along a cross-section of the product such that the product comprises a relatively low density core region and higher density outer regions, wherein a formwork is used for shaping the premix in the desired configuration, wherein the premix is confined in the formwork in order to contribute to the desired porosity profile, and wherein the formwork has a lid in order to restrain rising of the premix and cause collapsing of expanding premix on contact with the lid.

In accordance with the invention it is possible to vary the density of a given premix by varying the volume and distribution of gas bubbles present in the final product. This makes it possible to manufacture products with varying strength to density ratios from a

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of manufacturing a porous cementitious product, which method comprises:

forming a cementitious premix;

casting the premix in a desired configuration;

generating gas bubbles within the premix; and

curing the premix,

wherein the gas bubbles are generated and/or collapsed at specific locations within the premix in order to produce a porosity profile along a cross-section of the product such that the product comprises a relatively low density core region and higher density outer regions, wherein a formwork is used for shaping the premix in the desired configuration, wherein the premix is confined in the formwork in order to contribute to the desired porosity profile, and wherein the formwork has a lid in order to restrain rising of the premix and cause collapsing of expanding premix on contact with the lid.

2. A method according to claim 1, wherein gas bubbles are generated by incorporation in the premix of a heat-activated gas-generating agent.

3. A method according to claim 1, wherein the lid of the formwork is fabricated in such a way so as to allow gas dissipation when gas bubbles collapse at the premix/lid interface.

4. A method according to claim 1, wherein the upper surface of the premix is subjected to trowelling, screeding and/or rolling in order to cause collapsing of expanding premix.

5. A method according to claim 1, wherein the formwork is vibrated vertically and/or laterally at an appropriate frequency and amplitude in order to achieve an even distribution of premix within the formwork, to control the cross-sectional bubble

distribution and/or to improve the quality of finish of the product surfaces.

6. A method according to claim 4, wherein a formwork is used for shaping the premix and wherein the formwork is vibrated vertically and/or laterally at an appropriate frequency and amplitude in order to achieve an even distribution of premix within the formwork, to control the cross-sectional bubble distribution and/or to improve the quality of finish of the product surfaces.

7. A method according to claim 1, wherein gas bubbles are introduced at selected locations into a cast premix by use of sparging apparatus.

8. A method according to claim 7, wherein the sparging apparatus comprises a sparging lance comprising an elongate hollow member having a series of holes through which gas may be injected into the premix.

9. A method according to claim 8, wherein the lance is moved through the premix during gas injection to provide a distribution of bubbles appropriate to achieve the desired porosity profile.

10. A method according to claim 1, wherein the premix is sufficiently viscous to achieve gas bubble retention but not so highly viscous so as to inhibit bubble formation.

11. A method according to claim 10, wherein the viscosity of the premix is controlled by varying the premix temperature, by blending of fine materials into the premix to obtain desired particle gradation for optimal flow properties and/or by incorporation into the premix of appropriate additives.

12. A method according to claim 11, wherein the viscosity of the premix is controlled by incorporation into the premix of a superplasticiser.

13. A method according to claim 1, wherein the strength to density ratio of the cementitious product is controlled by varying the extent to which the premix is gassed.

14. A method according to claim 1, wherein the strength to density ratio of the cementitious product is controlled by varying the degree of confinement of the premix as it expands due to generation of gas bubbles within the matrix.

15. A method according to claim 1, wherein the strength to density ratio of the cementitious product is controlled by selection based on premix strength.

16. A method according to claim 1, wherein, prior to curing, an upper surface of the cementitious product is finished by cutting, trowelling, screeding or rolling.

17. A method according to claim 1, wherein the cementitious product has a consolidated, dense outer skin.

18. A method according to claim 1, wherein the premix is a high strength premix having a compressive strength of from 60 to 120 MPa (in non-gassed form).

19. A method according to claim 18, wherein the premix is used to manufacture a cementitious product having a dry density of from 1000 to 1500 kg/m^3 and compressive strength of 10 to 25MPa.

20. A method according to claim 18, wherein the cementitious product has a 1-day strength of from 75-90% of its 28-day strength.

21. A method according to claim 18, wherein the product is heat cured at atmospheric pressure.

22. A method according to claim 1, wherein the cementitious product exhibits a

flexural strength of from 3-4 MPa for compressive strengths of from 15-20 MPa for product densities of from 1300-1500 kg/m^3.

23. A method according to claim 1, wherein the cementitious product has a thermal conductivity of from 0.3-0.6 W/m.K for product dry densities of from 900-1300 kg/m^3.

24. A method according to claim 1, wherein high shear mixing is used to vary the premix temperature and/or the premix rheology thereby allowing the viscosity of the premix to be controlled.

25. A method according to claim 18, wherein the cementitious product has a relatively low residual water content.

26. A method according to claim 1, wherein the cementitious product is manufactured in the form of a flat slab, wall panel, roofing tile, block-work system or paver.

27. A method according to claim 1, wherein the formwork includes surface relief in order to produce a patterned surface on the product.

28. A method of manufacturing at least two cementitious products which are formed from a single cementitious premix and which have a different ratio of strength to density, which method comprises forming each cementitious product in accordance with the method claimed in claim 1 and wherein the strength to density ratio of each cementitious product is controlled by varying the degree confinement of the premix as it expands due to generation of gas bubbles within the matrix.

29. A cementitious product obtained by the method as claimed in claim 1.

30. A porous cementitious product having a porosity profile along a cross-section of

the product such that the product comprises a relatively low density core region and higher density outer regions, the higher density outer regions imparting impact resistance, abrasion resistance and resistance to water absorption.

31. Use of a cementitious product obtained by the method claimed in claim 1 in the construction industry as a building material.